

CLAIMS

What is claimed is:

1. A method of removing sulfur from a liquid hydrocarbon feed, the method comprising the steps of:

- 5 (a) dissolving metallic sodium in a solvent to form a solution;
- (b) combining said solution with a liquid hydrocarbon feed to form a first combined stream, said liquid hydrocarbon feed having a portion comprising at least one organosulfur species, and said step of combining occurring at a first desired temperature and at a first desired pressure, said first desired pressure being above the vapor pressure of
- 10 said solvent at said first desired temperature;
- (c) lowering the pressure of said first combined stream sufficiently to achieve vaporization of a substantial amount of said solvent from said first combined stream to produce a second composition;
- (d) combining said second composition with a hydrogen donor to form a third
- 15 composition;
- (e) reacting said third composition for a sufficient time and at a sufficient temperature to form fourth composition comprising a modified liquid hydrocarbon product containing sodium sulfide and a reduced amount of said organosulfur species; and
- (f) extracting a substantial amount of said sodium sulfide from said fourth
- 20 composition leaving a modified liquid hydrocarbon product.

2. The method of claim 1 wherein said step (f) is preceded by the step of cooling said fourth composition.

3. A modified liquid hydrocarbon product produced from the process of claim 2.

4. The method of claim 1 wherein said solvent is anhydrous ammonia.
5. The method of claim 1 wherein said first temperature is at or below 97.5°C
6. The method of claim 1 wherein said first temperature is about 25°C .
7. The method of claim 1 wherein said sufficient time in step (e) is about 5 minutes to about
5 60 minutes.
8. The method of claim 1 wherein said sufficient temperature in step (e) is in the range of
about 25°C to 350°C.
9. The method of claim 8 wherein said sufficient temperature in step (e) is in the range of
about 200°C to 350°C.
- 10 10. The method of claim 1 wherein said extraction step includes the step of introducing a
solvent for said sodium sulfide into said fourth composition.
11. The method of claim 10 wherein said solvent is ammonia.
12. The method of claim 1 wherein said molar ration of sodium to sulfur is in the range of
about 2.5:1 to 2:1.
- 15 13. The method of claim 1 wherein said hydrogen donor comprises hydrogen gas or a
hydrogen donor solvent.
14. A method of removing sulfur from a liquid hydrocarbon feed, the method comprising the
steps of:
 - (a) dissolving metallic sodium in a solvent to form a solution;
 - 20 (b) combining a liquid hydrocarbon feed with a hydrogen donor to form a first
combined stream, said liquid hydrocarbon feed having a portion comprising at least one
organosulfur species;
 - (c) combining said first combined stream with said solution to form a second

combined stream;

(d) lowering the pressure of said second combined stream sufficiently to achieve vaporization of a substantial amount of said solvent from said second combined stream thereby producing a third composition;

5 (e) reacting said third composition for a sufficient time and at a sufficient temperature to form a fourth composition containing sodium sulfide and a reduced amount of said organosulfur species; and

(f) extracting a substantial amount of said sodium sulfide from said fourth composition leaving a modified liquid hydrocarbon product.

10 15. A modified liquid hydrocarbon product produced from the process of claim 14.

16. The method of claim 14 wherein said solvent is anhydrous ammonia.

17. The method of claim 14 wherein said first temperature is at or below 97.5°C

18. The method of claim 14 wherein said first temperature is about 25°C .

15 19. The method of claim 14 wherein said sufficient time in step (e) is about 5 minutes to about 60 minutes.

20. The method of claim 14 wherein said sufficient temperature in step (e) is in the range of about 25°C to 350°C.

21. The method of claim 14 wherein said extraction step includes the step of introducing a solvent for said sodium sulfide into said fourth composition.

20 22. The method of claim 14 wherein said molar ration of sodium to sulfur is in the range of about 2.5:1 to 2:1.

23. The method of claim 14 wherein said hydrogen donor comprises hydrogen gas or a hydrogen donor solvent.